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Management Control Procedure

Software Management

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Contents

1. PURPOSE

The software management process provides a standardized approach to controlling *software applications* (see def.).

2. SCOPE

The software management process begins with the search for candidate software applications and continues through the *software application lifecycle* (see def.) of classifying, planning, designing, acquiring, developing, testing, accepting, operating, modifying, and retiring software applications.

This procedure applies to all software applications except:

A. Software applications and associated data that, as determined by the responsible manager, are **not** used for the purposes of analysis, design, or operation of a *structure, system, or component* (SSC; see def.) and are **not** shared with or used by other organizations, projects, or programs

B. Software applications that are part of a project with a non-INEEL participant, such as work for others (WFO), which proceeds in accordance with the customer's documented software requirements.

The following procedures control specific software types, and MCP-550 does not apply except where noted below:

A. MCP-3630, I&C Computer System Management, for instrumentation and control (I&C) software associated with an SSC

B. MCP-2391, Control of Measuring and Test Equipment; MCP-6303, Calibration of Installed Facility Process and Control Instrumentation; and MCP-93, Health Physics Instrumentation; for manufacturer-supplied software associated with measuring and test equipment (M&TE), process instrumentation, or health physics instruments validated during calibration, alarm checks, and control functions checks (Modifications to manufacturer-supplied software are controlled by MCP-550.)

C. MCP-2374, Analyses and Calculations, for use of *analysis software* (see def.) to perform engineering calculations (The software is developed and modified per MCP-550.)

D. MCP-3039, Analysis Software Control, which applies to analysis software that cannot be validated by the process directed by MCP-2374

E. MCP-292, Unclassified Computer Security Program, and/or MCP-307, Classified Information System Security, for security controls applied to unclassified and classified computer systems (see INEEL Safeguards and Security Website).

F. MCP-3765, Enterprise Architecture Product Classification, for software *supported products* (see def.).

PDD-122, Software Quality Assurance, provides a description of the software quality assurance program and an overview of the INEEL approach and documents used to manage software applications.

Appendix A, Software Management Process Overview, illustrates the MCP-550 process, including the relationships between this procedure and those procedures listed above.

Appendix B, Software Application Classification Criteria, provides guidance, information, and graded approach criteria regarding the software applications that fall within the scope of this procedure.

3. RESPONSIBILITIES

NOTE: *Line managers assign personnel to perform the tasks directed in this procedure as a function of their delegation authority and responsibility. One person may be assigned multiple performer responsibilities.*

Performer	Responsibilities
Software Project Manager (may be the software technical lead)	Provide overall software project direction and govern resources, cost, scope, and schedule. Oversee *software application classification* (see def.), acquisition, development, and modification. Oversee development, review, approval, and implementation of software application documentation.
Software Technical Lead(s) (may be the person who develops the software application)	Provide overall technical direction for the software project and implement the software management process, which includes software application: • Classification (with customer) • Design • Development • Documentation development • Evaluation, installation, testing, and maintenance.
Enterprise Architecture team (see def.)	Review assigned software application documentation for application integration and compatibility with the Enterprise Architecture.

Performer	Responsibilities
Customer (may be the software application user, owner, or manager)	Determine software application classification level(s) (with software technical lead). Provide information about software application requirements, business rules, and use activities. Review and approve software application documentation. Participate in software application acceptance testing, accept tested software application for use, and accept subsequent modifications.
Design Reviewer(s)	Review assigned software application documentation for conformance to requirements.
Line Manager (normally software technical lead's immediate functional support manager)	Oversee activities of software technical lead. Assign personnel. Review and approve software application documentation. Direct compliance evaluations of existing software applications.
Quality Engineer (QE)	Provide QE expertise and review software application documentation.
Software Quality Assurance (SQA) Group	Provide as-needed assistance and technical expertise in the management and implementation of the software application lifecycle.
Software Test Plan (STP) Preparer	Prepare software test plan and test cases.
Test Case Performer	Test the software application per the software test plan (STP).
System Administrator (also referred to as software administrator or application trustee)	Conduct and coordinate operations, maintenance, training, and use activities associated with the software application. Maintain software application configuration control and document, test, and verify software application configuration changes. Manage software application contracts, licenses and registrations, and costs.

4. INSTRUCTIONS

NOTE: *The Software Quality Assurance (SQA) group can provide assistance with implementing the MCP-550 process. An SQA group member can be contacted at SQAGROUP@inel.gov.*

4.1 Search for Candidate Software Applications

4.1.1 Software Technical Lead and/or Customer: Establish high-level software project scoping requirements.

4.1.2 Initiate an internal search for candidate software applications within the *Enterprise Architecture* (see def.) or request the Enterprise Architecture team to initiate a search.

4.1.3 If an acceptable software application is **not** internally available, request Software Classification and Export Control (SCEC) personnel to initiate an external (DOE-wide) search for candidate software applications.

NOTE: *The SCEC can be found in the Phone Services section of the Lotus Notes phone directory by typing "software."*

4.1.4 If SCEC-identified software application is **not** an acceptable candidate, notify SCEC personnel in writing, then continue with this procedure.

4.1.5 If SCEC-identified software application is acceptable, obtain software application through the SCEC, then classify the application and determine documentation requirements per section 4.3.

4.2 Controlling Routines, Spreadsheets, and Macros

4.2.1 Software Technical Lead and/or Customer: Use this section to control **only** *routines*, *spreadsheets*, or *macros* (see definitions) that can be documented in the product in which they are used and independently verified by visual inspection or hand calculation without recourse to the originator.

4.2.2 Uniquely identify the software routine, spreadsheet, or macro including version control.

4.2.3 Provide documentation that includes:

A. Inputs

B. Computer program generated correct results for a specified range of input parameters

C. Computer program generated evidence of the programmed algorithms or equations (such as computer programs listings and spreadsheet cell contents)

D. Verification results.

4.2.4 Identify the software used to develop the spreadsheet, routine, or macro, including the version.

4.2.5 Exit this procedure.

4.3 Software Application Classification and Documentation Requirements

NOTE: *Software management is an iterative process wherein the documentation may be developed or modified in whatever order is most effective based on the nature of the project and the development methodology selected following approval of the software management plan (SMP).*

4.3.1 Software Technical Lead and Customer: Determine project *software application classification* (see def.) level using Appendix B, Software Application Classification Criteria.

4.3.2 Classify software applications with multiple classification levels at the highest level or develop separate planning documents for each level.

NOTE: *The software application classification level is recorded during SMP development per section 4.4.*

4.3.3 Determine which software application documentation is required using Table 1, Software Application Documentation (see *section* 6 for definitions of software application documentation listed in Table 1).

4.3.3.1 For software applications within the same classification level, write and apply plans as either separate documents for each software application or as generic documents for all software applications managed by the organization.

4.3.3.2 Increase level of documentation rigor and detail as needed, to respond to other factors such as project complexity, dollar value, level of effort, or as directed by the customer.

Table 1. Software Application Documentation

Documentation	Level A	Level B	Level C	Level D
Software management plan (SMP)	R	R	R	P
Software quality assurance plan (SQAP)	R	R	R*	O*
Software configuration management plan (SCMP)	R	R	R*	O*
Software requirements specification (SRS)	R	R	R	O
Requirements traceability matrix (RTM)	R	R	R	O
Design description for software (DDS)	R	R	R	O
Software test plan (STP; includes test cases and test report)	R	R	R*	O*
User documentation	R	R	O	O

* = May be included in the software management plan.

R = Required for all acquired, developed, or modified software applications.

O = Optional based on graded approach (see step 4.3.4).

P = Partial; only the elements indicated for level D software in Appendix C are required.

4.3.4 Software Technical Lead: Based on the classification level, apply the following graded approach criteria to determine software application documentation format and content requirements:

A. **Level A —** document format must comply with Institute of Electrical and Electronic Engineers (IEEE) standards (see Appendix C, Documentation Requirements)

B. **Level B** — must provide specific details of how each requirement will be satisfied (see Appendix C, Documentation Requirements)

C. **Level C** — must provide a general statement that responds to each requirement or indicate "NA" to document that the requirement was at least considered (see Appendix C, Documentation Requirements)

D. **Level D** — must complete specified elements of an SMP (see Appendix C, Documentation Requirements); remainder of this procedure is optional and applied at the discretion of the customer, software technical lead, and software project manager.

4.3.5 If modifying an existing software application that does **not** meet the documentation requirements of this MCP, prepare at a minimum the software application documentation associated with the modification (see Table 1) and track all changes per the SCMP.

4.3.6 If modifying an existing software application that meets the documentation requirements of this MCP, revise the associated documentation as required and track all changes per the SCMP.

4.3.7 Document the software application lifecycle phases per the following sections using either the forms specified in this procedure or using a method that meets the minimum documentation requirements for the software application (see Appendix C, Documentation Requirements).

NOTE: *When using an alternate method of documenting the software application lifecycle, QE validation of the method will help assure compliance with applicable requirements.*

4.4 SMP, SQAP, and SCMP Development

4.4.1 Software Technical Lead: Obtain a unique software application identifier from Enterprise Architecture and enter the classification level.

NOTE: *The software application identifier is generated by the* Enterprise Architecture repository *(see def.) for each software application maintained in the repository.*

4.4.2 Obtain a Document Management Control System (DMCS) document number (PLN-XXXX) for each **new** plan and a document action request (DAR) number for each **new or revised** plan from the Electronic Document Management System (EDMS).

4.4.3 Fill out a form 412.11, DMCS Document Action Request (DAR; see the INEEL Companywide Forms index). Senior management DAR approval to proceed is not necessary and customer approval is only required after the SMP, SQAP, and SCMP are developed.

4.4.4 As determined in section 4.3, develop or modify the SMP, SQAP, and SCMP (see Appendix C for SMP, SQAP, and SCMP content requirements and forms information).

4.4.5 Provide the Enterprise Architecture team with a copy of the SMP (not required for WFO projects).

4.4.6 Using the DAR for each document, obtain SMP, SQAP, and SCMP reviews and approvals from the customer, software project manager, line manager, and QE

NOTE: *QE review and approval is only required for the SQAP, or for the SQAP section of the SMP if the documents are combined.*

4.4.7 Customer, Software Project Manager, QE, and Line Manager: Review and approve the SMP, SQAP, and SCMP.

4.4.8 Software Technical Lead: Complete a form 412.16, DMCS Document Data Input Sheet, (see the INEEL Companywide Forms index) for each plan and submit the forms, including the DAR(s), and approved plan(s) to a Document Control Center/Records Center for storage and delivery of the plans as controlled document(s).

NOTE: *The records coordinator for your organization can assist in completing the form 412.16. Your records coordinator can be located at the Employees by Qualifications/Certifications Web site by entering job code QLRCOORD and searching by organization number.*

4.5 Software Application Requirements and Traceability

4.5.1 Software Technical Lead and Customer: Develop or modify the SRS to include applicable software application requirements (such as operating, performance, interface, and access control requirements) using the SMP and/or SQAP for information (see Appendix C for SRS content requirements and SRS forms information).

4.5.2 Software Technical Lead: Designate requirements that cannot be fully defined at this time as TBD or specify them to the level of detail based on available information. Document who will provide the fully defined requirement and at what time (by either date or project milestone).

NOTE: *If a software application is being developed or modified in an iterative process, the design activities proceed based on the approved requirements for that iteration. Requirements marked TBD or those requiring more detailed description are completed when the information is available, and before final testing and owner acceptance is completed.*

4.5.3 Develop or modify the data requirements for the project and document them per MCP-1223, Electronic Data Management.

4.5.4 Provide the Enterprise Architecture team with a copy of the SRS (not required for WFO projects).

4.5.5 Obtain SRS reviews and approvals from the customer, software project manager, and line manager.

NOTE: *The SRS documentation is submitted to a Document Control Center/Records Center for records processing and storage with the SMP during the section 4.9 turnover phase.*

4.5.6 Customer, Software Project Manager, and Line Manager: Review and approve the SRS.

4.5.7 Software Technical Lead: Before applying any change to the approved list of requirements, obtain approval from all concerned individuals (customer and development). Do not change requirements until the impact on estimated resource use and schedules has been determined, reviewed, and accepted.

4.5.8 Software Technical Lead: Initiate a *requirements traceability matrix* (RTM; see definition; also see Appendix C for RTM content requirements and RTM forms information.).

4.5.9 Software Technical Lead and Customer: Based on available information, determine if the software application will be acquired or developed (the make/buy decision).

NOTE: *Further information about obtaining an* acquired software application *(see def.) or about developing the software application may be obtained from the Software Quality Assurance (SQA) group, which can be contacted at SQAGROUP@inel.gov.*

4.5.10 If developing or modifying the software application, proceed with the design per section 4.6.

4.5.11 If acquiring a commercial off-the-shelf (COTS) software application, GO TO MCP-1185, Acquisition of Materials and Services, to initiate acquisition; THEN RETURN TO:

A. Section 4.6 of this procedure for software applications that require further design

B. Section 4.8 of this procedure for software applications that will be used as is.

4.5.12 If acquiring a software application that will be developed by a subcontractor (not COTS), GO TO MCP-1185, Acquisition of Materials and Services, to acquire it and ensure the following subcontractor requirements are met; THEN RETURN TO section 4.8 of this procedure to begin acceptance testing:

A. Qualified software subcontractor has been identified

B. Software requisition has been developed per MCP-1185

C. Software development process has been defined

D. Software quality assurance requirements have been defined

E. Software configuration management requirements have been defined

F. Compliance testing of the delivered software product(s) has been defined

G. Documentation required by this procedure is included as a deliverable item in the subcontract

H. Method for tracking the subcontractor's actual performance and results has been defined

I. Subcontractor is cognizant of the company's software quality requirements, and, if applicable, has demonstrated ability to comply with NQA-1 subpart 2.7 requirements.

4.6 Software Application Design

4.6.1 Software Technical Lead: Determine if the software that will be used to develop, implement, and install the software application is an INEEL *supported product* (see def.). If it is not a supported product, contact the Enterprise Architecture team.

4.6.2 Obtain the following inputs as needed to develop the design:

A. Logical object/data model (see MCP-1223)

B. Data dictionary (see MCP-1223)

C. RTM

D. SQAP

E. Functional design notes

F. Programming standards.

4.6.3 Prepare or modify the following design documentation as needed using a supported product or the DDS form (see Appendix C for DDS content requirements and DDS forms information):

A. Program specifications

B. Physical model

C. Data dictionary

D. Process model (customer business model)

E. Data flow diagram (system model)

F. RTM.

4.6.4 Document in a DDS any design modules that are not documented by the use of a supported product.

4.6.5 Software Project Manager and Software Technical Lead: As identified in the SQAP, select design reviewers who:

A. Have **not** designed the new or modified software application

B. Have demonstrated technical expertise relevant to the design being reviewed or technical experience on similar designs sufficient to assess the technical adequacy of the design and compliance with design inputs.

4.6.6 Obtain line manager input and agreement regarding design review team member selection.

4.6.7 Software Technical Lead: Distribute the design package to the design reviewers. Include:

A. SRS

B. RTM (optional)

C. DDS

D. Form 562.29, Software Design Review Report and Checklist (optional; see the INEEL Companywide Forms index)

E. Other pertinent design documentation (see step 4.6.3).

4.6.8 Design Reviewers: Review the software application design package to verify the design meets requirements and provide any comments to the software technical lead.

4.6.9 Software Project Manager and/or Software Technical Lead: Resolve comments and update documentation as needed per the applicable sections of this procedure.

4.6.10 Software Technical Lead: Obtain and document design reviewer concurrence.

NOTE: *The design documentation is submitted to a Document Control Center/Records Center for records processing and storage with the SMP during the section 4.9 turnover phase.*

4.6.11 Provide the Enterprise Architecture team with a copy of the DDS.

4.7 Software Application Development

4.7.1 Software Technical Lead: Implement the design and develop the software application.

4.7.1.1 Update the RTM.

4.7.1.2 Initiate development of test cases and acceptance criteria (see Appendix C for STP test case content requirements and forms information).

4.7.1.3 Initiate development of user documentation.

4.7.2 Perform verification testing, including resolution of TBD requirements, and modify the affected software application code.

4.7.3 Manage error and corrective action tracking per the SMP and/or SQAP.

4.8 Software Application Test Plan Development

4.8.1 Software Technical Lead: For software classification levels A and B, or as recommended by the software project manager, designate a competent STP preparer who is independent from the software application design and development.

4.8.2 Obtain the following input document(s) to generate the STP:

A. SRS for requirements acceptance criteria

B. DDS for guidance on testing methodologies and the operating environment to be used during testing

C. RTM

D. Draft test cases and acceptance criteria, if available.

4.8.3 Software Technical Lead or STP Preparer: Develop an STP that includes test cases to verify the software application meets the requirements as defined in the SRS (see Appendix C for STP content requirements and STP forms information).

OR

4.8.4 For level C, document the test cases either in the STP or as part of the RTM.

4.8.5 Software Technical Lead, QE, and Software Project Manager: If the STP is being developed or updated separately (not rolled up to an SMP), complete the following steps.

4.8.5.1 Software Technical Lead: Obtain a DMCS document number (PLN-XXXX) and a DAR number from the Electronic Document Management System (EDMS).

4.8.5.2 Fill out a DAR (form 412.11; see the INEEL Companywide Forms index). Senior management DAR approval to proceed is not necessary.

4.8.5.3 Obtain STP and test case review and approval from the software project manager using the DAR.

4.8.5.4 Provide the QE with a copy of the test cases.

4.8.5.5 Software Project Manager: Review and approve the STP.

4.8.5.6 Software Technical Lead: Complete a form 412.16, DMCS Document Data Input Sheet, (see the INEEL Companywide Forms index) and submit it, the DAR, and approved STP to a Document Control Center/Records Center for storage and delivery of the STP as a controlled document.

NOTE: *The records coordinator for your organization can assist in completing the form 412.16. You records coordinator can be located at the Employees by Qualifications/Certifications Web site by entering job code QLRCOORD and searching by organization number.*

4.9 Software Application Final Testing, Acceptance, and Turnover

4.9.1 Software Technical Lead: Oversee performance of software application testing per the STP.

4.9.2 Test Case Performer: Test the software application per the STP and work with the software technical lead to resolve deficiencies.

4.9.3 Software Project Manager, QE, and Software Technical Lead: Review and approve the test report results to ensure compliance with criteria stated in the STP.

4.9.4 Software Technical Lead: Complete the final testing phase and submit the testing documentation to a Document Control Center/Records Center for storage with the STP.

4.9.5 Establish the *software application baseline* (see def.) and turn over the software application to the customer per the SMP and/or SCMP. Coordinate with the customer regarding the following turnover activities:

A. System operation and maintenance responsibilities

B. Completion and issuance of user documentation

C. Change control (such SMP and/or SCMP updates to reflect a more rigorous production environment change control process)

D. Error reporting

E. Corrective action processes.

4.9.6 Customer: Accept the software application for its intended use based on successful final testing and the adequacy of software application documentation.

4.9.7 Software Technical Lead: Contact Software Classification Export Control (SCEC) personnel to determine if the software application requires registration for export control and Office of Scientific and Technical Information (OSTI) purposes.

NOTE: *The SCEC can be found in the Phone Services section of the Lotus Notes phone directory by typing "software."*

4.9.8 Forward the final project data dictionary, conceptual data model, and interface documentation to the Enterprise Architecture team per MCP-1223, Electronic Data Management (not required for WFO projects), or notify them that the documentation is available in EDMS.

4.9.9 Customer and/or Software Technical Lead: Validate the following completed requirements and design documentation per MCP-557 and/or your organization's records management plan and submit it to a Document Control Center/Records Center for records processing and storage with the SMP as quality records:

A. SRS

B. RTM

C. DDS

D. Form 562.29

E. Other pertinent requirements and design documentation.

4.9.10 Perform records analysis per MCP-557 to identify other records that are generated within the software application.

4.9.11 Declare in the Enterprise Architecture repository (menu selection: RM File Analysis) the records or non-record data identified (not required for WFO projects).

4.10 Software Application Operations and Maintenance

NOTE: *This section may not apply to WFO projects.*

4.10.1 System Administrator: Before distributing any software application to entities external to the INEEL or allowing access to it by any foreign national, obtain software application export control review by Software Classification Export Control (SCEC) personnel.

NOTE: *The SCEC can be found in the Phone Services section of the Lotus Notes phone directory by typing "software."*

4.10.2 Implement user access controls per the documented system requirements (SRS) and in accordance with the INEEL computer security program.

4.10.3 Maintain the software application in coordination with functional users, technical support staff, and supplier per the SMP and/or SCMP.

4.10.4 Manage maintenance contracts, license registrations, budget work packages, and user communications associated with the software application.

4.10.5 Control, document, test (including *regression testing* [see def.]), and verify software application configuration changes (see *configuration control board* definition) per the SMP and/or SCMP and this procedure (see steps 4.3.6 and 4.3.7).

4.10.6 Prepare or modify user documentation as needed (such as desktop guides, user instructions, MCPs, and training material) for the use of the software application and management of application data.

4.10.7 Resolve production software application errors per the SMP and/or SCMP.

4.11 Evaluation of Existing Software Applications

4.11.1 Line manager: Oversee and direct compliance evaluations of existing software applications.

4.11.2 Software Technical Lead and/or System Administrator: Determine if software application meets **any** of the following criteria:

A. Software application is being modified for a new intended use

B. Software application is being modified or enhanced for continued use

C. Software application has been located (see section 4.1) and will have a new intended use.

4.11.3 If software application meets **any** of the criteria in step 4.11.2, use this procedure to bring documentation into compliance.

4.11.3.1 Determine if a *software application classification* (see def.) exists, and if there is no classification or it is inadequate for the intended use, classify the software application per section 4.3 (see Appendix B, Software Application Classification Criteria).

4.11.3.2 Upgrade existing documentation applicable to the system component(s) affected by the change to meet the content specified in the graded approach process of this procedure (upgrade of format and structure conventions not required) (see Appendix C, Documentation Requirements).

NOTE: *The Software Quality Assurance (SQA) group, which can be contacted at SQAPGROUP@inel.gov, is available to help in determining the extent of and most efficient approach to accomplishing this task.*

4.12 Software Application Retirement

NOTE: *This section may not apply to WFO projects.*

4.12.1 Customer: When the software application is determined to be obsolete or no longer required, request the software technical lead or system administrator to permanently retire software application.

4.12.2 Software Technical Lead or System Administrator: Determine how the software application and data will be retired per the SMP and/or SCMP.

4.12.3 Update the SMP and/or SCMP as needed to reflect current conditions.

4.12.4 Terminate support for the software application to be retired and prevent routine use of the application.

4.12.5 Notify the Enterprise Architecture team of the software application retirement.

4.12.6 Cancel or update affected documents as applicable.

4.12.7 Disposition for final archival any data in databases, files, and associated scripts and documentation of the software application necessary for maintaining application history per MCP-557, Managing Records.

5. RECORDS

NOTE 1: *All records become the responsibility of the customer after software application turnover. Uniform File Code, disposition authority, and retention periods are determined by LST-9, INEEL Records Schedule Matrix.*

NOTE 2: *SMC uses an approved controlled document retrieval system and records storage repository that meet the intent of EDMS as referenced in this procedure.*

Records Description	Uniform File Code	Disposition Authority	Retention Period
Software management plan (SMP) Software quality assurance plan (SQAP) Software configuration management plan (SCMP) Software requirements specification (SRS) Requirements traceability matrix (RTM) Design description for software (DDS) Form 562, 29, Software Design Review Report and Checklist Software test plan (STP) User instructions	1205	A20-10.1-a	Lifetime QA record managed per MCP-557. Destroy after the expiration of the retention period authorized for related disposable records (i.e., in accordance with this schedule or other DOE schedules) or when related system is removed from service.

6. DEFINITIONS

acquired software application. A commercial off-the-shelf (COTS) software application that is purchased from an external supplier, or a software application that is developed under a subcontract with the INEEL.

analysis software. Software that is used in a program or project to perform analyses or calculations.

configuration control board (CCB). A group of people responsible for evaluating and approving or disapproving proposed changes to *configuration items* (see def.) and for ensuring implementation of approved changes.

configuration item. Hardware or software elements treated as a unit for the purpose of configuration control.

design description for software (DDS). Documentation that specifies the design of a software application.

Enterprise Architecture. A depiction of the current and future information and technology assets in terms of the software applications and technical infrastructure used to support company missions and operational functions. A critical aspect of the *Enterprise Architecture* is the establishment of technology directions, standards, investment strategies, and data management in response to changing business needs.

Enterprise Architecture team. A group of employees assigned to support the *Enterprise Architecture*.

Enterprise Architecture repository. A database that serves as the valid source for all *Enterprise Architecture* information. The database is the source for information about:

A. Software applications and data dictionaries

B. Software components and tools used to build and deploy software applications

C. Servers

D. Standards and technology directions

E. Business functions supported by software applications.

macro. A predefined sequence of computer instructions that is inserted into a program, usually during assembly or compilation, at each place that the corresponding macroinstruction appears in the program.

regression testing. Selective retesting of a system or component to verify that modifications have not caused unintended effects and that the system or component still complies with its specified requirements.

requirements traceability matrix (RTM). A representation of requirements specification information that provides a many-to-many map from and to each requirement, and to and from various system and software artifacts. The artifacts may address design, source, test, or other such topics. Minimally, the RTM indicates the test cases for each requirement and the requirements that are tested by each test case.

routine. A subprogram that is called by other programs and subprograms.

software application. Computer programs and code, including databases, spreadsheets, macros, routines, and Web pages (both static and dynamic) developed to fulfill specific user needs, such as data maintenance, data manipulation, calculations, and reporting. A software application is supported by documentation that describes its functions, uses, and maintenance (that is, plans, requirements documentation, user manuals, data dictionary, etc.).

software application baseline. A software application that has been formally reviewed and agreed upon, and that can only be changed through formal change control processes.

software application classification. A rating applied to a software application based on the intended nature of its use and consequences of failure. The software application classification is used to determine the level of rigor applied to its development, modification, operation, and maintenance (see Appendix B, Software Application Classification Criteria, for more information).

software application lifecycle. A period of time that begins with the identification of need for a software application and ends when the application is retired. Lifecycle phases include project planning, requirements definition, design, implementation, testing, acceptance, turnover, operations, maintenance, and retirement.

software configuration management plan (SCMP). A document that describes the actions taken to identify configured items, actions to control changes to those items, actions to provide current status of all ongoing changes, and the personnel responsible for those actions.

software management plan (SMP). The document used to control software project management activities by describing the administrative processes used to acquire, design, develop, and/or modify the software applications.

software quality assurance plan (SQAP). A plan for the development of software applications that provides adequate confidence that the software conforms to established requirements.

software requirements specification (SRS). The document that specifies the requirements of a software application.

software test plan (STP). A document or collection of documents for controlling, executing, and documenting the software testing process.

spreadsheet. A row and column layout of information that may include text, numbers, calculations, and macros. Software products such as MS Excel and Quattro Pro are typically used to build spreadsheets.

structure, system, or component (SSC). Structures are elements that provide support or enclosure, such as buildings, freestanding tanks, basins, dikes, and stacks. Systems are collections of components assembled to perform a function, such as heating, ventilating, and air conditioning systems, control systems, utility systems, reactor cooling systems, or fuel storage systems. Components are items of equipment such as pumps, valves, and relays; or elements of a larger array such as computer software, lengths of pipe, elbows, or reducers.

supported product. A software tool (such as a Data Base Management System [DBMS], language, or desktop productivity suite) and hardware (such as a desktop or server) approved to be used for the creation, maintenance, and deployment of software applications. The company supported software products report (also referred to as company standard products list) is managed by IRM.

user documentation. User manuals and reference materials other than online help functions.

7. REFERENCES

IEEE 1058, Recommended for Software Project Management Plans

IEEE 730, IEEE Standard for Software Quality Assurance Plans

IEEE 828, IEEE Standard for Software Configuration Management Plans

IEEE 830, Recommended Practices for Software Requirements Specification

IEEE 1016, IEEE Recommended Practice for Software Design Descriptions

IEEE 829, IEEE Standard for Software Test Documentation

IEEE 1063, IEEE Standard for User Documentation

PRD-171, Information Management

PRD-5092, Software Quality Assurance

PDD-122, Software Quality Assurance

MCP-93, Health Physics Instrumentation

MCP-292, Unclassified Computer Security Program

MCP-307, Classified Information System Security

MCP-540, Documenting the Safety Category of Structures, Systems, and Components

MCP-557, Managing Records

MCP-1185, Acquisition of Materials and Services

MCP-1223, Electronic Data Management

MCP-2374, Analyses and Calculations

MCP-2391, Control of Measuring and Test Equipment

MCP-3039, Analysis Software Control

MCP-3630, I&C Computer System Management

MCP-3765, Enterprise Architecture Product Classification

MCP-6303, Calibration of Installed Facility Process and Control Instrumentation

GDE-7066, Software Development Resources

LST-9, INEEL Uniform File Codes

Form 412.11, DMCS Document Action Request (DAR)

Form 412.16, DMCS Document Data Input Sheet

Form 241.07, INEEL Records Analysis Transmittal Form

Form 416.04, Quality Record(S) Validation/Verification Form

Form 562.25, Software Configuration Management (SCMP)

Form 562.26, Software Management Plan (SMP)

Form 562.27, Software Quality Assurance Plan (SQAP)

Form 562.28, Software Test Plan (STP)

Form 562.29, Software Design Review Report and Checklist

Form 562.30, Design Description for Software (DDS)

Form 562.31, Requirements Traceability Matrix (RTM)

Form 562.32, Software Requirements Specification (SRS)

8. APPENDICES

Appendix A, Software Management Process Overview

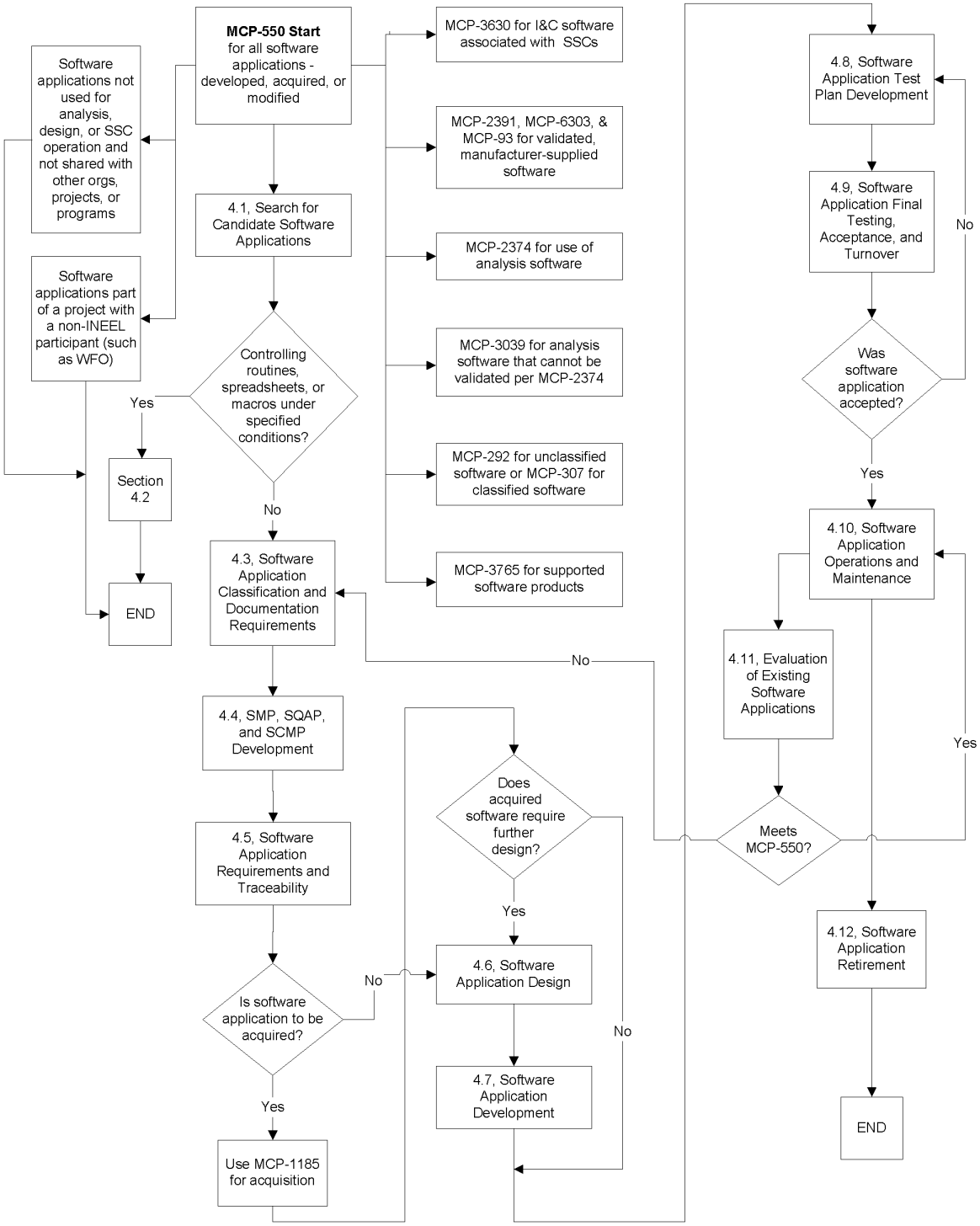
Appendix B, Software Application Classification Criteria

Appendix C, Documentation Requirements

Appendix D, MCP-550 Procedure Basis

Appendix A

Software Management Process Overview



Appendix B

Software Application Classification Criteria

A software application is classified based on the intended nature of its use and consequences of failure. The software application classification is used to determine the level of rigor applied to its development, modification, operation, and maintenance.

The table below provides a crosswalk of companywide MCP-550, MCP-540, and PRD-171 classification levels (not inclusive of facility-, organization-, or discipline-specific quality level designations).

MCP-550	MCP-540	PRD-171
Level A	Safety Class (SC) and Safety Significant (SS)	Mission Essential
Level B	Low Safety Consequence (LSC)	Mission Critical
Level C	Consumer Grade (CG)	Mission Important
Level D	Consumer Grade (CG)	Deferrable

Software applications managed within the scope of this procedure are rated according to one of the following four classifications:

Level "A" – This classification level includes SC, SS, or mission essential software applications that meet one or more of the following criteria:

A. Application has a direct or indirect effect on nuclear safety protection systems or toxic material hazard systems that keep exposure to the general public and workers below regulatory or evaluation guidelines

B. Application is used to make decisions that could result in death or serious injury or are part of the evaluation in accident analyses

C. Application would place either INEEL employees or the public in a position of immediate danger in the event that it was unavailable

D. Application provides primary support to a process that would require DOE Headquarters approval to delay.

Level "B" - This classification level includes LSC or mission critical software applications that meet one or more of the following criteria:

A. Application failure would have an unacceptable impact by causing significant INEEL mission failure and significant production investment costs and/or recovery costs

B. Application is important to continued operations of the business and is used to support decisions regarding operating activities

C. Application is used to comply with regulatory laws, environmental permits or regulations, and/or other commitments to compliance

D. Application is required for emergency communications with local, state, and federal government agencies

E. Application provides primary support to a process that must be back on-line within a period of time not to exceed five (5) days, and for which delays exceeding five days would jeopardize some aspect of INEEL mission success

F. DOE-ID approval is required to institute alternative support mechanisms or operate without the process.

Level "C" - This classification level includes CG or mission important software applications that meet one or more of the following criteria:

A. Application is important to the day-to-day administration of the business but its failure to perform as intended will **not** adversely affect the safety or reliability of operations and will **not** result in significant financial or program capability losses

B. Application provides primary support to an operation that must be back on-line within a period of time not to exceed thirty (30) days

C. Application failure or loss of data can affect departmental performance, but does not affect mission success

D. Senior management approval is required to institute alternative support mechanisms or to operate without the process.

Level "D" - This classification level includes CG or deferrable software applications that meet one or more of the following criteria:

A. Application is within the scope of this procedure, but does **not** meet the criteria specified in the above classification levels

B. Application failure would have a short-term affect on an individual's performance and data may have to be recreated, but the failure would not affect INEEL mission success

C. There is no associated minimum delay criteria related to the restoration of the data

D. Approval of immediate management is required to institute an alternative support mechanism or to operate without the process

E. Application is used for preliminary or scoping activities only.

If the software application will be used later to meet a higher classification, documentation is developed to comply with that classification and the iterative steps taken in the preliminary stages of development are documented.

Appendix C

Documentation Requirements

Classification Level A Documentation Requirements

The format of documentation for Level A software applications must comply with IEEE standards and guides as indicated in the following table:

Software Documentation	IEEE Standard/Guide
Software management plan (SMP)	IEEE 1058
Software quality assurance plan (SQAP)	IEEE 730
Software configuration management plan (SCMP)	IEEE 828
Software requirements specification (SRS)	IEEE 830
Requirements traceability matrix (RTM)	Use MCP-550 RTM form or equivalent
Design description for software (DDS)	IEEE 1016
Software test plan (STP; includes test cases and test reports)	IEEE 829
User instructions	IEEE 1063

Employees can access online IEEE standards and guides as follows:

1. Go to; LIBHOST.INEL.GOV
2. Click on; Standards (left-side bar)
3. Click on; IEEE (2nd line)
4. Click on; IHS Specs & Standards – Enter Here.

Classification Level B, C, and D Documentation Requirements

For software applications classified as level B or C, all of the elements of the software management documents described below are required. The level of detail provided for each element is based on the graded approach in step 4.3.4. For software applications classified as level D, only the specified portions of a software management plan are required; all other documentation is optional (see Table 1).

Based on the classification level of the software application project, the software management documents may be developed as separate documents or combined as needed. Refer to GDE-7066, Software Development Resources, for more information regarding the content of the software management documents described below.

Software Management Plan (SMP)

Form 562.26, Software Management Plan, may be used to document the SMP (see the INEEL Companywide Forms index). For level D software applications, only list items A through F below need to be addressed. For software applications classified as level B or C, the required SMP elements are:

A. Title of the software project or application

B. Software application identifier

C. SMP identifier, revision, and effective date

D. Customer and charge number

E. Software classification level and how that classification was determined

F. Business need and scope (high-level requirements) of the project

G. Assumptions on which the project is based and how inputs based on assumptions will be tracked and verified

H. Constraints such as schedule, budget, and resources

I. Actions taken to address accessibility for handicapped individuals (see the guidance under "Standards/Guidelines" of the Enterprise Architecture homepage)

J. Methodologies, including lifecycle and development methodologies, programming languages, tools, and technical standards

K. Project responsibilities and interfaces

L. Project deliverables and controlling documents

M. Schedule, cost, milestones, and resources, including critical milestones and resource requirements

N. Project status reporting mechanisms that will communicate the status of requirements, schedule, budget, quality, identified risks, and other related information

O. Turnover and closeout actions necessary to conduct an orderly turnover, closeout, and baseline of the project to the customer

P. Retirement plans, including user notifications, application removal, termination of support, and costs that may be incurred.

Software Quality Assurance Plan (SQAP)

Form 562.27, Software Quality Assurance Plan, may be used to document the SQAP (see the INEEL Companywide Forms index). For software applications classified as level B or C, the required SQAP elements are:

A. Title of the software project or application

B. Software application identifier

C. SQAP identifier, revision, and effective date

D. Classification level

E. Actions to be taken to assure the final software application will satisfy customer needs for product quality and timeliness

F. Personnel who will perform the quality assurance activities, such as the independent verifier and/or QE, and a description of their responsibilities

G. Training required for personnel performing project quality assurance activities

H. Quality assurance activities that will be performed (such as document reviews, test observations, error reporting, and corrective action tracking), at which phases of the project they will be performed, and by whom

I. Quality assurance standards, practices, and tools that will be used to perform and manage the QA activities

J. Processes and methods for identifying project risk factors

K. Documentation and records that result from project quality activities.

Software Configuration Management Plan (SCMP)

Form 562.25, Software Configuration Management Plan, may be used to document the SCMP (see the INEEL Companywide Forms index). For software applications classified as level B or C, the required SCMP elements are:

A. Title of the software project or application

B. Software application identifier

C. SCMP identifier, revision, and effective date

D. Classification level

E. Role of the SCMP in controlling configuration items

F. Change control board (CCB) chairman and members by name or position, and their responsibilities and authorities

G. Baseline activities

H. Uniquely identified configuration items, their descriptions and locations, current status, and method for documenting and tracking changes to them

I. Process(es) by which changes will be requested, evaluated, approved, tested (including regression testing), and implemented

J. Disposition of all configuration items after the project is turned over

K. Backup and recover actions or plans.

Software Requirements Specification (SRS)

List items as requirements ONLY if their achievement can be validated.

Form 562.32, Software Requirements Specification, may be used to document the SRS (see the INEEL Companywide Forms index). For software applications classified as level B or C, the required SRS elements are:

A. Title of the software project or application

B. Software application identifier

C. Classification level

D. SRS revision and date

E. Unique identifier for each requirement

F. Priority ranking for each requirement in relation to all other requirements

G. Requirement description (desirable condition or capability), which includes:

- Operating system
- Functionality
- Internal and external interfaces
- Performance requirements
- Design inputs and constraints
- Access control

- Maintainability
- Portability
- Installation considerations

H. Verifiable requirements.

Requirements Traceability Matrix (RTM)

Form 562.31, Requirements Traceability Matrix, may be used to document the RTM (see the INEEL Companywide Forms index). For software applications classified as level B or C, the required RTM elements are:

A. Identifier and description of each requirement from the SRS

B. Module or form identifier, name, and description associated with the requirement

C. Test case number or test description

D. If RTM is documenting the test cases, the tester's name and date the requirement passed the test.

Design Description for Software (DDS)

Form 562.30, Design Description for Software, may be used to document the DDS (see the INEEL Companywide Forms index). For software applications classified as level B or C, the required design deliverable are:

A. Title of the software project or application

B. Software application identifier

C. Classification level

D. DDS revision and date

E. Unique identifier and description for each module

F. Modules from which inputs are received and to which outputs are provided, including interface dependencies

G. Operating system environment

H. Programming environment.

Software Test Plan (STP)

Form 562.28, Software Test Plan, may be used to document the STP (see the INEEL Companywide Forms index). The STP form includes the test plan, test cases, and test report. Therefore, the content elements for all three are included in this description. The test plan, test cases, and test report may be developed, as needed, as separate documents.

For software applications classified as level B or C, the required test plan elements are:

A. Title of the software project or product

B. Software application identifier

C. STP identifier, revision, and effective date

D. Classification level

E. Resources required to perform the test cases, such as personnel, training, and experience requirements, equipment, documents, data sets, and access controls

F. Conditions required to perform testing or limit the extent of testing, such as configurations, events, operating environment, and hardware and software configuration requirements

G. Schedule of test cases in the order in which they will be performed and when in the software development process they will be performed, including interface testing, verification testing at each phase of development, and validation at the end of the development cycle

H. Recovery actions to be taken in the event of a test failure and conditions under which regression testing, which is required for errors introduced during modifications, will be necessary.

For software applications classified as level B or C, the required test case elements are:

A. Unique identifier as used in the RTM (Each test case must be associated to a specific requirement. There are typically several test cases for each requirement.)

B. Software tester's name

C. Date the test was executed

D. Specific steps to be taken (Each test case generally has multiple steps, but each step can only describe a single action.)

E. Objective criteria to determine the success or failure of the test step and traceability to applicable requirements

F. Indication of test step success or failure and information pertinent to the failure of the test step

G. Summary of the failure or success of the test case, and, if applicable, results of interface testing and regression testing of modifications

H. Confirmation of completion.

For software applications classified as level B or C, a final test summary report of all test cases is also required.

Appendix D

MCP-550 Procedure Basis

Step	Basis	Source	Citation
Entire MCP	Software development shall proceed in a traceable, planned, and orderly manner.	PRD-5092	4.1.1.2
2.	Computer software used to produce or manipulate data, which is used directly in the design, analysis, and operation of structures, systems, and components shall comply with the requirements of this PRD. The application of specific requirements shall be prescribed in *software quality assurance plan(s)* (see def.) and in written policies and procedures. All software will be controlled based on DOE and company management expectations for managing government-furnished resources.	PRD-5092 Best Business Practice	4.1.1.1
4.1.2	The *Enterprise Architecture* personnel shall maintain an inventory of software applications.	PRD-171	3.9.6
4.1.3, 4.1.4, 4.1.5	Software Classification personnel shall review and control all INEEL developed software related technology for export and sharing of information concerning INEEL developed software products for non-proliferation and national security.	PRD-171	3.7.1
4.2	Spent Nuclear Fuels, and NRC-licensed program applications shall comply with all the requirements of DOE/RW-0333P, Supplement I, "Software", . . .	PRD-5092	4.2
4.3	A graded approach based upon risk shall be used in categorizing *systems, structures, and components* (see def.) for applying QA controls, as referenced in Subsection 4.1.2.	PRD-5071	4.1.1.17
4.3	The number of software life cycle phases and relative emphasis placed on each phase of software development will depend on the nature and complexity of the software.	PRD-5092	4.1.1.3

Step	Basis	Source	Citation
4.3.3.1	The software quality assurance plan may be prepared individually for each software project, or may exist as a generic document to be applied to software prepared within or procured by an organization, or may be incorporated into the overall quality assurance program.	PRD-5092	4.1.3.1 Note
4.4	All INEEL organizations that develop and/or maintain software shall have a planning document that describes the effort for that project.	PRD-171	3.11.1
4.4	A software quality assurance plan shall be developed for each new software project at the start of the software life cycle, or for procured software when it enters the purchaser's organization.	PRD-5092	4.1.3.1
4.4	All INEEL organizations that develop and/or maintain software shall establish a configuration management program.	PRD-171 PRD-5092	3.11.2 4.1.11
4.4	The software quality assurance plan shall identify…	PRD-5092	4.1.3.2
4.4.5, 4.5.4, 4.6.5	A member of the Architecture team shall review all software development that is either new or an enhancement to an existing system.	PRD-171	3.8.2
4.4, 4.5, 4.6, 4.7, 4.8, 4.9.3	The preparation, issue, and change of documents that specify quality requirements or prescribe activities affecting quality such as instructions, procedures, and drawings shall be controlled to ensure that correct documents are being employed.	PRD-5077	General
4.5	Software design requirements shall be identified and documented and their selection reviewed and approved.	PRD-5092	4.1.4
4.6.1	The INEEL shall develop and facilitate computer hardware and software standards to facilitate the interoperability of application software.	PRD-171	3.9.2
4.6.1, 4.6.3, 4.6.4	The software design shall be translated into computer program(s) using the programming organization's or design organization's programming standards and conventions.	PRD-5092	4.1.6.1

Step	Basis	Source	Citation
4.6.5 through 4.6.11	Design reviews shall be controlled and performed to ensure that…	PRD-5074	4.1.7
4.6.8	Design phase software verification and validation activities shall consist of the following	PRD-5092	4.1.5.3
4.6.11	The software design process shall be documented, approved by the responsible design organization, and controlled.	PRD-5092	4.1.1.4
4.6, 4.7	Software design and implementation documentation shall include…	PRD-5092	4.1.5.2
4.7.1.3, 4.9.5, 4.10.6	User information shall be developed, documented, and reviewed in accordance with the design to delineate how to use the software.	PRD-5092	4.1.6.2
4.7.2, 4.8, 4.9	Software verification and validation activities shall…	PRD-5092	4.1.2.1
4.8, 4.9	Computer program testing shall be performed and shall be in accordance with PRD-5082, 11.1 Test Control.	PRD-5092	4.1.7
4.8.3, 4.9.3	Computer program test procedures shall provide for demonstrating the adherence of the computer program to documented requirements.	PRD-5092	4.1.7.2 4.1.7.5 4.1.7.6 4.1.7.7 4.1.7.8
4.9.5	A software configuration baseline shall be established at the completion of each activity of the software design process.	PRD-5092	4.1.11.3
4.9.5, 4.9.6	The documentation of the approval of the software for operational use.	PRD-5092	4.1.9.1.B
4.9.7, 4.10.1	Software Classification personnel shall submit software resulting from scientific and technical endeavors to the DOE Office of Scientific and Technical Information to promote scientific advancement is (1) made broadly available, (2) prevent duplication of efforts, and (3) ensure a fair return on Departmental and taxpayer investment.	PRD-171	3.7.2

Step	Basis	Source	Citation
4.9.8	Software developers shall provide a Data Dictionary and Data Model for each software application.	PRD-171	3.8.1 3.8.3 3.8.4 3.8.5
4.10.7	A software defect reporting and resolution system shall be implemented for software errors and failures to assure that problems are promptly reported to impacted organizations and to assure formal processing of problem resolutions.	PRD-5092	4.1.12.1
4.10	Further activity shall consist of maintenance of the software to remove latent errors (corrective maintenance), to respond to new or revised requirements (perfective maintenance), or to adapt the software to changes in the operating environment (adaptive maintenance). Software modifications shall be approved, documented, verified and validated and controlled.	PRD-5092	4.1.8.2 4.1.8.3
4.11	Existing software and procured or otherwise acquired software that has not been previously approved under a program consistent with the requirements of this document for use in its intended application shall be evaluated in accordance with the requirements of this document.	PRD-5092	4.1.14
4.12	During the retirement phase, the support for a software product is terminated and the routine use of the software shall be prevented.	PRD-5092	4.1.10
5.	CPR This Program Requirements Document (PRD) identifies requirements and responsibilities for identifying, administrating, and storing documents designated as quality assurance (QA) records.	PRD-5088	General